

What is claimed is:

1. A trench structure of a semiconductor device comprising:

a first region of a substrate having a first trench, the first trench having a first aspect ratio;

a first filling element having a first insulation material continuously formed on a bottom face and sidewalls of the first trench, and a second insulation material completely filling a first sub-trench formed in the first trench by the formation of the first insulation material;

a second region of the substrate having a second trench, the second trench having a second aspect ratio smaller than the first aspect ratio; and

a second filling element having a third insulation material continuously formed on a bottom face and sidewalls of the second trench, a fourth insulation material formed on a bottom face and sidewalls of a second sub-trench formed in the second trench by the formation of the third insulation material, and a fifth insulation material completely filling a third sub-trench formed in the second sub-trench by the formation of the fourth insulation material.

2. The trench structure of a semiconductor device as claimed in claim 1, wherein the first aspect ratio is at least about twice the second aspect ratio.

3. The trench structure of a semiconductor device as claimed in claim 1, wherein the first insulation material is identical to the third and fifth insulation materials.

4. The trench structure of a semiconductor device as claimed in claim 3, wherein the first, third and fifth insulation materials include an oxide.

5. The trench structure of a semiconductor device as claimed in claim 1, wherein the second insulation material is identical to the fourth insulation material.

6. The trench structure of a semiconductor device as claimed in claim 5, wherein the second and fourth insulation materials include a silicon-containing material.

7. The trench structure of a semiconductor device as claimed in claim 1, wherein the first trench is formed in a cell region of the substrate, and the second trench is formed in a peripheral region of the substrate.

8. A method of forming trench structures of a semiconductor device comprising:

successively forming a pad oxide film and a hard mask on a substrate;  
successively etching the hard mask and the pad oxide film to form a first hard mask pattern, a second hard mask pattern, a first pad oxide pattern,

and a second pad oxide pattern to form a first contact having a first width corresponding to the first hard mask pattern and the first pad oxide pattern, and a second contact having a second width wider than the first width corresponding to the second hard mask pattern and the second pad oxide pattern;

forming a first trench having a first aspect ratio under the first contact, and a second trench having a second aspect ratio smaller than the first aspect ratio under the second contact by etching portions of the substrate exposed through the first and the second contacts;

continuously forming a first insulation material on the first trench, the second trench and the substrate;

continuously forming a second insulation material on the first insulation material wherein the first trench is completely filled with the second insulation material;

forming a third insulation material on the second insulation material wherein the second trench is completely filled with the third insulation material;

successively removing the third insulation material, the second insulation material and the first insulation material to expose surfaces of the first and the second hard mask patterns;

removing the first and the second hard mask patterns; and

removing the first pad oxide pattern, the second pad oxide pattern, the first insulation material remaining on the substrate, the second insulation material remaining on the substrate, and the third insulation material remaining on the substrate to form a first trench structure and a second trench structure

on the substrate.

9. The method of forming trench structures of a semiconductor device as claimed in claim 8, wherein the first aspect ratio is at least about twice the second aspect ratio.

10. The method of forming trench structures of a semiconductor device as claimed in claim 8, wherein the first trench is formed in a cell region of the substrate, and the second trench is formed in a peripheral region of the substrate.

11. The method of forming trench structures of a semiconductor device as claimed in claim 8, wherein the first and third insulation materials include an oxide.

12. The method of forming trench structures of a semiconductor device as claimed in claim 11, wherein the oxide includes high density plasma oxide, TEOS or USG.

13. The method of forming trench structures of a semiconductor device as claimed in claim 8, wherein the second insulation material includes un-doped silicon or silicon nitride.

14. The method of forming trench structures of a semiconductor device as claimed in claim 13, wherein the second insulation material is formed by a low pressure chemical vapor deposition process.